

### REMARKS

Favorable reconsideration of this application in view of the remarks to follow is respectfully requested. Since the present Response raises no new issues, and in any event, places the application in better condition for consideration on appeal, entry thereof is respectfully requested under the provisions of 37 C.F.R. §1.116.

In the present Final Action, the specification stands objected to as containing terms that are allegedly unclear. Specifically, it is the Examiner's position that the terms "trimethyl or triethyl" are not compounds. In response to the Examiner's comments and for the purposes of advancing prosecution, applicants have amended the specification to more clearly and positively recite that the alkyl-containing compound comprises trimethyl or triethyl substituents. Applicants submit that, in light of the current amendment, the objection to the specification has been obviated and respectfully request that the objection be withdrawn.

Claim 21 stands objected to for allegedly containing minor editorial errors. Specifically, it is the Examiner's position that the term "macrocycles" is misspelled. In response to the Examiner's comments and for the purposes of advancing prosecution applicants have amended Claim 21 to more clearly and positively recite "macrocycles". Applicants submit that, in light of the current amendment, the objection to Claim 21 has been obviated and respectfully request that the objection be withdrawn.

Claim 56 stands objected to for allegedly containing minor editorial errors. Specifically, it is the Examiner's position that Ruthium Carbonyl is listed correctly as  $\text{Ru}_3(\text{CO})_{12}$ , but is incorrectly set forth as  $\text{Ru}_3\text{CO}_{12}$ . In response to the Examiner's position and for the purposes of advancing prosecution applicants have amended Claim 56 to remove  $\text{Ru}_3\text{CO}_{12}$ . Therefore, in light of the amendment to Claim 56, applicants submit that the instant objection is obviated and respectfully request that the objection to Claim 56 be withdrawn.

Claims 35-38 stand rejected under 35 U.S.C. §112, fifth paragraph, for being dependent on both Claim 1 and Claim 24, where the dependency is not in the alternative. In response to the Examiners comments and for the purposes of advancing prosecution applicants have amended Claims 35-38 to remove the dependency to Claim 1 and have added the term "said" prior to the phrase "precursor source mixture". Therefore, in light of the current amendments applicants

submit that the present rejection has been obviated and respectfully request that the rejection under 35 U.S.C. §112, fifth paragraph, be withdrawn.

Before addressing the prior art rejections under 35 U.S.C. §102 and 35 U.S.C. §103, applicants have amended Claim 1 to more clearly and positively recite applicants' claimed precursor source mixture. More specifically, applicants have amended Claim 1 to recite that applicants' precursor source mixture comprises at least one precursor compound which is dissolved, emulsified or suspended in an inert organic liquid. Amendments have also been made to dependent Claims 2, 14, 15, 16, 19, and 21 to be consistent with amended Claim 1. Support for the amendment to Claim 1 is found on Page 15, lines 15-30 of applicants' specification. More specifically, applicants disclose that the inert liquid is preferably a C<sub>5</sub>-C<sub>12</sub> alkane. Applicants have also amended Claim 1 to recite the *proviso that the precursor compound is not tantalum cyclopentadienyl hydride or copper bound to a β-diketonate, β-diiminate, β-diketiminato, and the proviso that the precursor compound is not bound to a diketoamido (RC(O)NC(O)CR), imidoylamidinato (RC(NH)NC(NH)CR), ketimidoylamidinato RC(O)NC(NH)CR, or hydrocarbyl C(R<sub>2</sub>)C(CH<sub>3</sub>)<sub>2</sub>C(R<sub>2</sub>)N(R<sub>2</sub>) ligand, wherein R is a hydrocarbon.*

Claims 1, 2, 16-22, 24, 26-32 and 57 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by U.S. Patent. No. 5,393,564 to Westmoreland ("Westmoreland, et al."). Claims 1, 2, 14-22, 24-32, and 40 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by U.S. Patent. No. 5,449,799 to Terfloth, et al. ("Terfloth, et al"). Claims 1, 2, 14-22, 24-32, and 39-40 stand rejected under 35 U.S.C. §102(a),(e) as allegedly anticipated by U.S. Patent. No. 6,105,917 to Bhandari, et al. ("Bhandari, et al").

It is axiomatic that anticipation under §102 requires the prior art reference to disclose every element to which it is applied. *In re King*, 801 F.2d 1324, 1326, 231 USPQ 36, 138 (Fed Cir, 1986). Thus, there must be no differences between the subject matter of the claim and the disclosure of the prior art reference. Stated another way, the reference must contain within its four corners adequate direction to practice the invention as claimed. The corollary of the rule is equally applicable: absence from the applied reference of any claimed element negates anticipation. *Kloster Speedsteel AB v. Crucible Inc.*, 793 F.2d 1565, 1571, 230 USPQ 81, 84 (Fed. Cir. 1986).

Turning to the §102(b) rejection of Claims 1, 2, 16-22, 24, 26-32 and 57 citing Westmoreland, et al., applicants respectfully submit that Westmoreland, et al. fail to teach each and every element of applicants' claimed precursor source mixture utilized for chemical vapor deposition or atomic layer deposition. Specifically, Westmoreland, et al. fail to teach at least one precursor compound, which is dissolved, emulsified or suspended in an inert *organic* liquid, as recited in amended Claim 1. Westmoreland, et al. disclose a method directed to the use of a non-volatile precursor suitable for chemical vapor deposition of a semiconductor film, where the precursor is dissolved in a solvent. Referring to Column 4, lines 10-17, Westmoreland, et al. disclose that solvent is an *inorganic liquid* such as: liquid ammonia (NH<sub>3</sub>), liquid NO<sub>2</sub>, liquid SO<sub>2</sub>, liquid TiCl<sub>4</sub>, liquid TaCl<sub>5</sub>, liquid WF<sub>6</sub>, liquid SiCl<sub>4</sub>, borazine, dimethyl hydrazine, liquid xenonfluorides, liquid phosphine, liquid arsine, diethylzinc, BCl<sub>3</sub>, BF<sub>3</sub>, SF<sub>6</sub>, H<sub>2</sub>S, SiF<sub>4</sub>, CBrF<sub>3</sub>, CCl<sub>2</sub>F<sub>2</sub>, CCl<sub>3</sub>F, CClF<sub>3</sub>, CCl<sub>4</sub>, SiH<sub>2</sub>Cl<sub>2</sub>. Westmoreland, et al. fail to disclose that the solvent is an *organic* liquid. Therefore, Westmoreland, et al. fail to teach each and every element of the applicants' claimed precursor source mixture, as recited in amended Claim 1. In view of the above amendments and remarks, the 35 U.S.C. §102 (b) rejection to Claims 1, 2, 16-22, 24, 26-32 and 57 citing Westmoreland, et al. has been obviated.

Turning to the rejection of Claims 1, 2, 14-22, 24-32, and 40 citing Terfloth, et al., applicants' respectfully submit that Terfloth, et al. fail to disclose each and every element of the applicants' claimed precursor source mixture. More specifically, applicants submit that Terfloth, et al. fail to disclose one of applicants' claimed precursor compounds. Applicants' claimed precursor compounds comprise a precursor metal atom bound to a ligand selected from the group consisting of hydride, carbonyl, imido, hydrazido, phosphido, nitrosyl, nitryl, nitrate, nitrile, halide, azide, siloxy, silyl, with the *proviso that the precursor compound is not* an alkylamine, alane, MeAu(PMe<sub>3</sub>), or (Me<sub>3</sub>P)Cu(*tert*butoxy), tantalum cyclopentadienyl hydride, or *copper bound to a β-diketonate, β-diiminate, or β-diketiminato*. Additionally, applicants disclose, referring to Page 6, lines 26-28, of specification, that copper precursors bound to *β-diketoiminate ligands* disadvantageously have complex decomposition pathways, which can lead to incorporation of substantial quantities of carbon or unwanted impurities being incorporated into the resultant films.

Terfloth, et al. disclose a method of depositing copper-containing layers on substrates by decomposition of organometallic copper compounds. More specifically, Terfloth, et al. disclose a *copper precursor bound to RC(O)CC(O)CR (i.e., a  $\beta$ -diketonate), RC(NH)CC(NH)CR (i.e., a  $\beta$ -diiminate), or RC(O)CC(NH)CR (i.e., a  $\beta$ -diketoiminate ligand), where R is acetylacetonato*. Amended Claim 1 recites that the precursor compound may not include *copper bound to a  $\beta$ -diketonate,  $\beta$ -diiminate, or  $\beta$ -diketiminato*. Therefore, since Terfloth, et al. do not disclose one of applicants' claimed precursor compounds, Terfloth, et al. fail to teach each and every element of applicants' claimed precursor source mixture, as recited in amended Claim 1. In view of the above amendments and remarks, the rejection to Claims 1, 2, 14-22, 24-32, and 40 citing Terfloth, et al. has been obviated.

Turning to the 35 U.S.C. §102 (a),(e) rejection of Claims 1, 2, 14-22, 24-32, and 39-40 citing Bhandari, et al., applicants' respectfully submit that Bhandari, et al. fail to disclose each and every element of applicants' claimed precursor source mixture, as recited in amended Claim 1. More specifically, applicants submit that Bhandari, et al. fail to disclose one of applicants' claimed precursor compounds. Applicants' claimed precursor compounds comprise a precursor metal atom bound to a ligand selected from the group consisting of hydride, carbonyl, imido, hydrazido, phosphido, nitrosyl, nitril, nitrate, nitrile, halide, azide, siloxy, silyl, *with the proviso that the precursor compound is not an alkylamine alane, MeAu(PMe<sub>3</sub>), or (Me<sub>3</sub>P)Cu(tertbutoxy), tantalum cyclopentadienyl hydride, or copper bound to a  $\beta$ -diketonate,  $\beta$ -diiminate,  $\beta$ -diketiminato*. Bhandari, et al. disclose *tantalum amide precursors* for deposition of TaN, specifically being a *Ta cyclopentadienyl hydride precursor*. Applicants note that *Ta cyclopentadienyl hydride precursors* are excluded from the scope of amended Claim 1. In view of the above amendments and remarks, the 35 U.S.C. §102 (a), (e) rejection to Claims 1, 2, 14-22, 24-32, and 39-40 citing Bhandari, et al. has been obviated and applicants' respectfully request that the rejection be withdrawn.

The forgoing remarks clearly demonstrate that the applied references do not teach each and every aspect of the claimed invention as required by *King and Kloster Speedsteel; et. al.*, therefore the claims of the present application are not anticipated by the disclosures of Terfloth, et al., Westmoreland, et al., and Bhandari, et al. Applicants respectfully submit that the instant §102 rejections have been obviated and withdrawal thereof is respectfully requested.

Claims 1, 2, 14-22, 24-32, 39-54 and 56 stand rejected under 35 U.S.C. §103(a) as allegedly obvious over U.S. Patent No. 6,225,237 to Vaarstra ("Vaarstra") in view of Bhandari et al. Claims 33-38 stand rejected under 35 U.S.C. §103(a) as allegedly obvious by the combination of Vaarstra, Bhandari, et al. and U.S. Patent No. 5,879,459 to Gadgil, et al. ("Gadgil, et al."). Claim 55 stands rejected under 35 U.S.C. §103(a) as allegedly obvious by the combination of Vaarstra, Bhandari, et al., Gadgil, et al., and U.S. Patent No. 5,668,028 to Bryant, et al. ("Bryant, et al."). Claims 1, 2, 14-22, 24-32, and 39-40 stand rejected under 35 U.S.C. §103(a) as allegedly obvious over of U.S. Patent No. 6,214,729 to Uhlenbock, et al. ("Uhlenbock, et al.") in view of Bhandari. Applicants traverse the above rejections and submit the following.

Applicants submit that the combination of applied references does not render applicants' claims unpatentable since the applied references do not teach or suggest the use of one of applicants' claimed precursor compounds. "To establish a prima facie case of obviousness of a claimed invention all the claimed limitations must be taught or suggested by the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 44, 496 (CCPA 1970).

Referring to the 35 U.S.C. §103(a) rejection of Claims 1, 2, 14-22, 24-32, 39-54 and 56 over Vaarstra in view of Bhandari, et al., applicants' respectfully submit that the applied references fail to teach or suggest each and every element of applicants' claimed precursor source mixture. Bhandari, et al., as discussed above, do not teach or suggest the use of one of applicants' claimed precursor compounds, as recited in amended Claim 1. Applicants find no motivation in Bhandari, et al. that would lead one to replace elements of the prior art with one of the presently claimed precursor compounds. Vaarstra does not alleviate the defect in Bhandari, et al. since the applied secondary reference fails to teach or suggest the use of one of applicants' claimed precursors. Vaarstra discloses a method of forming a film on a substrate using one or more complexes containing RC(O)NC(O)CR diacetamido, RC(NH)NC(NH)CR imidoylamidinato, or RC(O)NC(N)CR ligands. Claim 1 has been amended to exclude precursors bound to RC(O)NC(O)CR diacetamido, RC(NH)NC(NH)CR imidoylamidinato, or RC(O)NC(N)CR ligands, wherein R is a hydrocarbon. Therefore, since Vaarstra does not disclose one of applicants' claimed precursor compounds, Vaarstra fails to teach or suggest each and every element of the applicants' claimed precursor source mixture, as recited in amended

Claim 1. In view of the above amendments and remarks, the rejection under 35 U.S.C. §103(a) of Claims 1, 2, 14-22, 24-32, 39-54 and 56 over Vaarstra in view of Bhandari, et al. has been obviated.

Claims 33-38 stand rejected under 35 U.S.C. 103(a) as allegedly obvious by the combination of Vaarstra, Bhandari, et al., and Gadgil, et al. Claims 33 and 34 are dependent on Claim 24, which in turn is dependent on amended Claim 1. If an independent claim is non-obvious under 35 U.S.C. §103(a), then any claim depending therefrom is non-obvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Claims 35-38 have been amended to incorporate the limitations of the precursor source mixture as recited in amended Claim 1. Vaarstra and Bhandari, et al., as discussed above, do not teach or suggest the use of one of applicants' claimed precursor compounds, as recited in amended Claim 1.

Gadgil, et al. do not alleviate the defects in Vaarstra and Bhandari, et al., since Gadgil, et al. also fail to teach or suggest applicants' claimed precursor compounds. Gadgil, et al. disclose a low profile, compact atomic layer deposition reactor having a low profile body with a substrate processing region adapted to serve a single substrate or a planar array of substrates, and a valved load and unload port for substrate loading and unloading. Applicants submit that Gadgil, et al. are far removed from applicants' claimed invention and find no motivation in Gadgil, et al. that would lead one to replace elements of the prior art with one of the presently claimed precursor compounds. In view of the above amendments and remarks, the rejection to Claims 33-38 under 35 U.S.C. §103(a) citing the combined disclosures of Vaarstra and Bhandari, et al., and Gadgil, et al. has been obviated. Therefore, applicants respectfully request that the 35 U.S.C. §103(a) rejection of Claims 33-38 be withdrawn.

Turning to the rejection of Claim 55 under 35 U.S.C. 103(a) over the combination of Vaarstra, Bhandari, Gadgil, et al., and Bryant, et al., applicants respectfully submit that Bryant, et al. also fail to teach or suggest one of applicants' claimed precursor compositions as recited in amended Claim 1. Bryant, et al. disclose a gate structure in a transistor and a method for fabricating the gate structure in a transistor. Bryant, et al. do not teach or suggest one of applicants' claimed precursor compounds, as recited in amended Claim 1. Applicants respectfully submit that in light of the above remarks and amendments the present rejection has

been obviated. Therefore, applicants respectfully request that the rejection of Claim 55 under 35 U.S. C. §103(a) be withdrawn.

Turning now to the 35 U.S.C. §103(a) rejection of Claims 1, 2, 14-22, 24-32, and 39-40, over Uhlenbock, et al. in view of Bhandari, et al., applicants respectfully submit that Uhlenbock, et al. also fail to teach or suggest each and every limitation of applicants claimed precursor source mixture. Uhlenbrock, et al. disclose the use of  $C(R_2)C(CH_3)_2C(R_2)N(R_2)$  hydrocarbyl ligands, where R represents a hydrocarbon. Applicants' have excluded any precursors bound to  $C(R_2)C(CH_3)_2C(R_2)N(R_2)$  hydrocarbyl ligands. Therefore, Uhlenbrock, et al. fail to teach or suggest each and every limitation of applicants' claimed precursor composition. In view of the above amendments and remarks, the 35 U.S.C. §103(a) rejection of Claims 1, 2, 14-22, 24-32, and 39-40, citing the combined disclosures of Uhlenbock, et al. and Bhandari, et al. has been obviated. Applicants respectfully request the 35 U.S.C. §103(a) rejection be withdrawn.

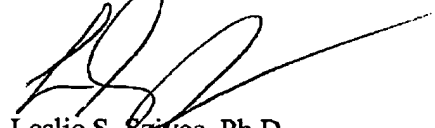
The §103 rejections also fail because there is no motivation in the applied references, which suggests modifying the metal precursor compounds to include applicants' claimed precursor composition. This rejection is thus improper since the prior art does not suggest this drastic modification. The law requires that a prior art reference provide some teaching, suggestion, or motivation to make the modification obvious.

Here, there is no motivation provided in the disclosures of the applied prior art reference, or otherwise of record, which would lead one skilled in the art to make the modification mentioned hereinabove. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 972 F.2d, 1260,1266, 23 USPQ 1780,1783-84 (Fed. Cir. 1992).

There is no suggestion in the prior art of applicants' claimed metal precursor compound as recited in amended Claim 1, therefore all the claims of the present application are not obvious from the prior art applied in the present Office Action. Based on the above amendments and remarks, each of the §103 rejection has been obviated; therefore reconsideration and withdrawal of the instant §103 rejections are respectfully requested.

Wherefore, reconsideration and allowance of the claims of the present application, as amended, is respectfully requested.

Respectfully submitted,



Leslie S. Szivos, Ph.D.  
Registration No. 39,394

SCULLY, SCOTT, MURPHY & PRESSER  
400 Garden City Plaza  
Garden City, New York 11530  
(516) 742-4343  
LSS/HAH:kc/gc